

5.1.11.2 WAC FM LINEARITY CALIBRATION RESULTS

As reported in Reference 5.1.11.2-1

Reference 5.1.11.2-1 - IOM 388-PAG-CCA97-6, "WAC FM Calibration Results: Linearity", C. Avis, September 24, 1997

5.1.11.2.1 INTRODUCTION

The Wide-angle Flight Model thermal/vacuum testing included the acquisition of a set of images for determination of the system gain. The image data was taken at a temperature of +25° and +5° C. This data set is also applicable to the derivation of the system linearity. The term 'linearity' describes how closely the camera response to light fits a linear function.

5.1.11.2.2 METHOD

For this camera system, the DN resulting from an exposure may be described by the following equation.

$$DN = VL(T - t_0) + DC_T + DN_0$$

where DN is the measured pixel value
 V is the system sensitivity (in DN/radiance_unit-milliseconds)
 L is the measured radiance (in arbitrary radiance_units)
 T is the commanded exposure time (in milliseconds)
 t_0 is the known shutter-offset (a function of image sample number, in msec)
 DN_0 is the bias level (in DN)
 DC_T is the dark-current level (a function of exposure time, in DN)

Analysis so far of DC_T indicates that for the exposure used here (maximum of 1000 msec), this value should be less than one DN. Therefore, the above equation is simplified to

$$DN = VL(T - t_0) + DN_0$$

Because the shutter-offset was previously derived, only V and DN_0 need to be solved for. DN_0 could be measured by zero-exposure images, but it falls out of the least-squares fit anyway.

Images at the same signal level are combined to produce signal and energy values at 100 small (20 pixel by 20 pixel) areas at all available signal levels. Energy values come from the product of the exposure time (corrected for shutter-offset) and the radiance of the source. Values for Sensitivity and the Bias level are then derived at each of these small areas independently. This is done by solving the above equation using least-squares.

The 100 derived values are then compared and any areas giving values more than 2 sigma from the mean are flagged as bad. Global values for V and DN_0 are then derived by averaging the values at the remaining good areas.

Using these best-fit V and DN_0 , a calculated value DN can be determined for each exposure time. The absolute deviation from linearity

$$A(T) = DN(T) - DN(T)$$

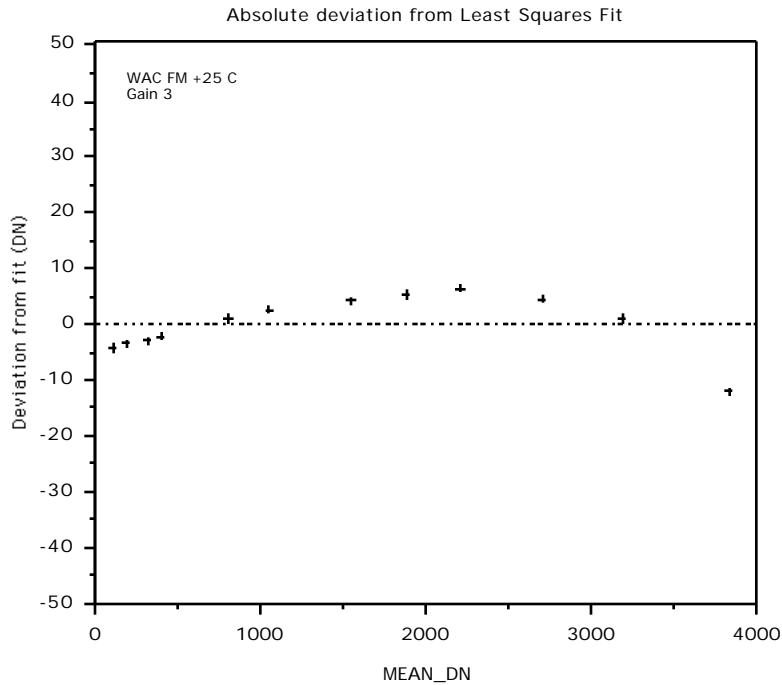
and the relative deviation from linearity

$$R(T) = (DN(T) - DN(T)) / DN(T)$$

can be used as measures of linearity over the range of exposure times used.

5.1.11.2.3 RESULTS

The following plot shows a typical fit. The absolute deviation is plotted to illustrate how the Least Squares solution distributed the deviations over the range of DN.

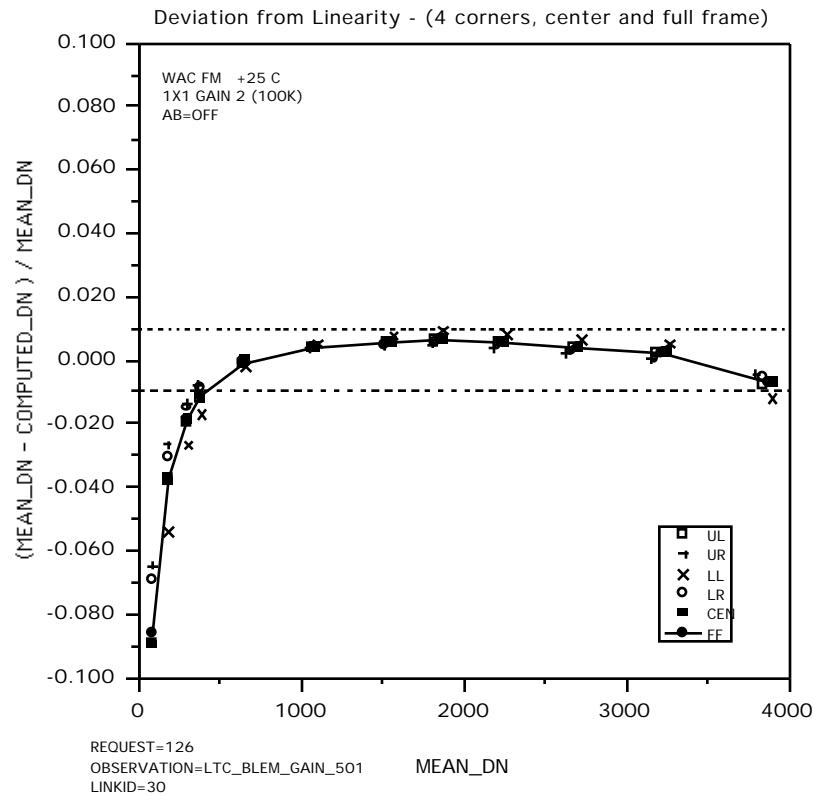
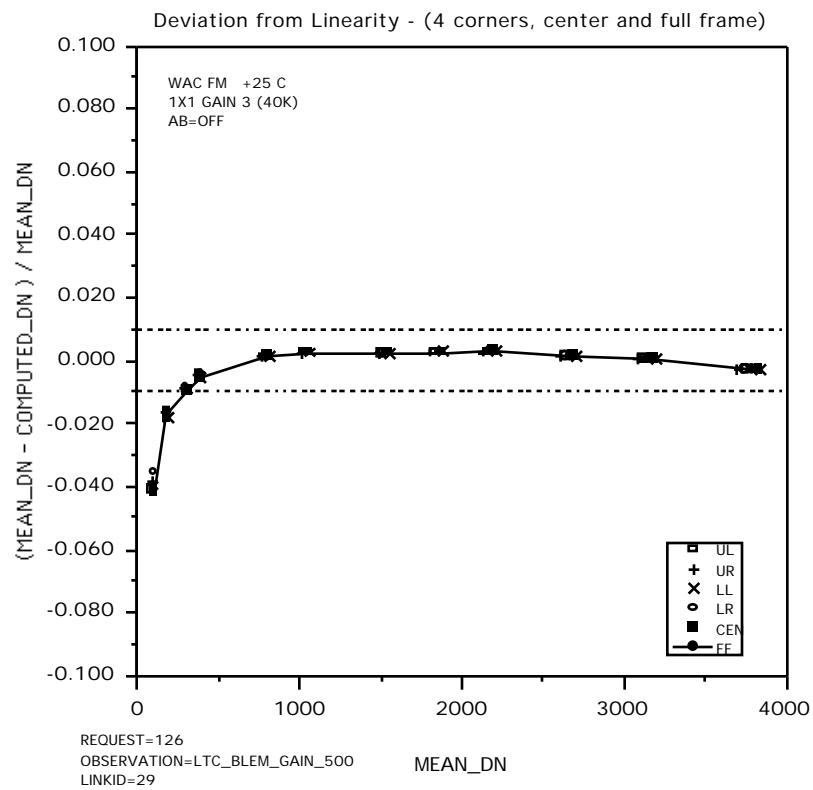


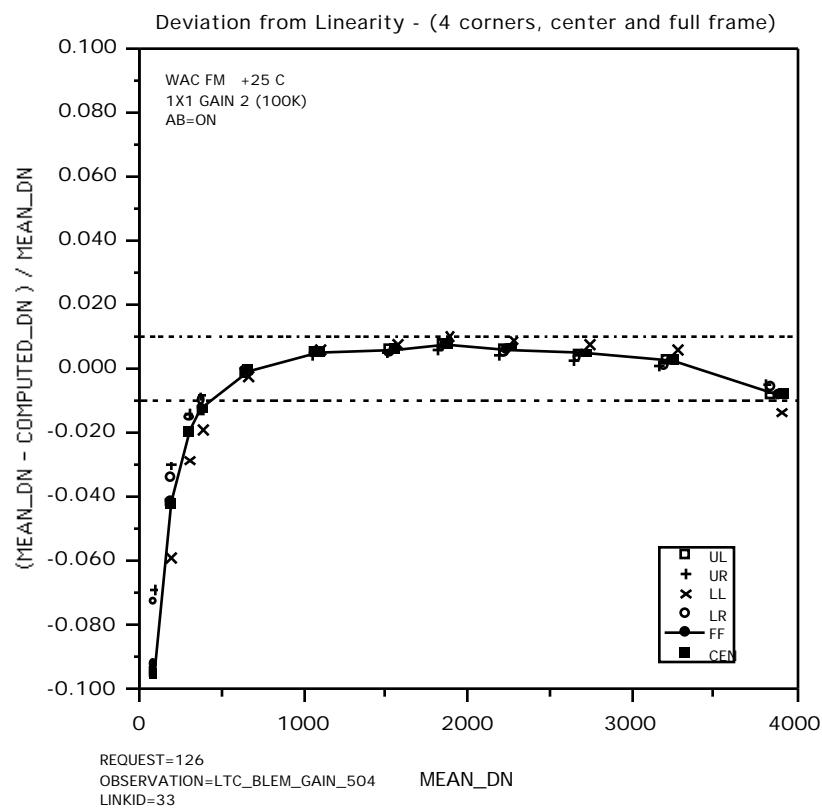
Generating the relative deviation from the absolute deviation distorts the symmetry of the absolute deviation curve by dividing by small mean DN numbers on one end and by large ones on the other. This typically yields a plot with worse relative deviations at the low DN range.

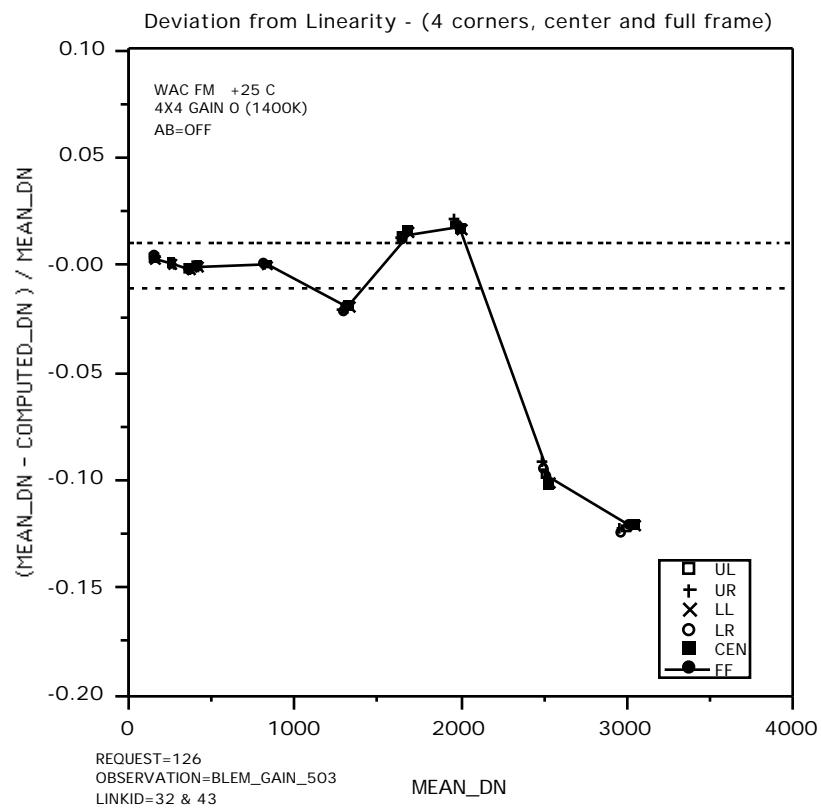
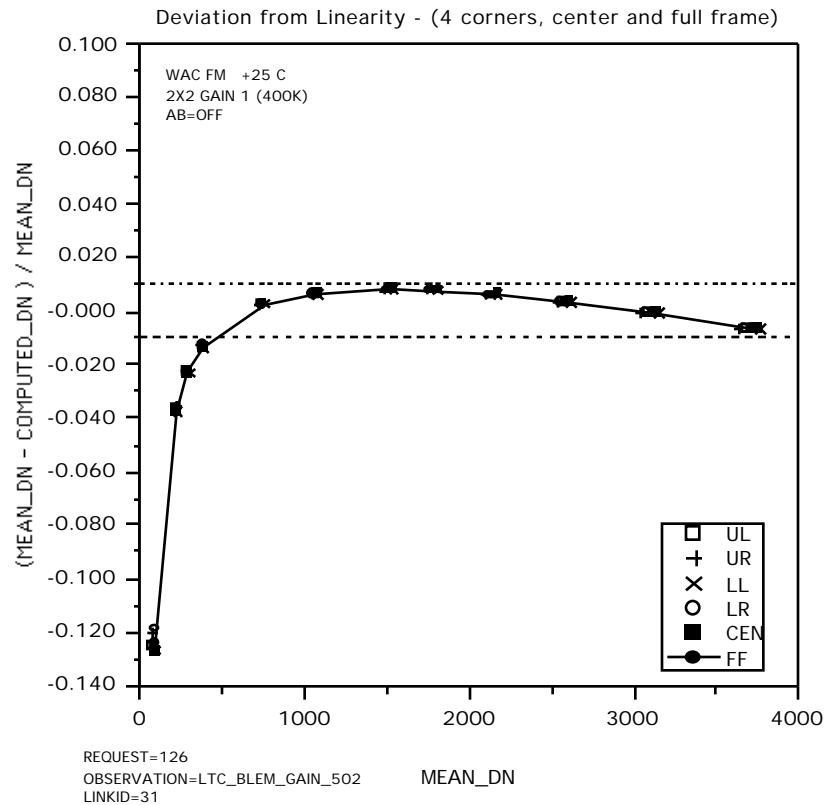
The plots which follow show the deviation from linearity for each Gain state. The deviation is shown as a function of signal level for the corner regions, the center and for the whole frame. Points for each region are plotted and the line connects the points for the entire frame. The dashed lines indicate $\pm 1\%$ deviation.

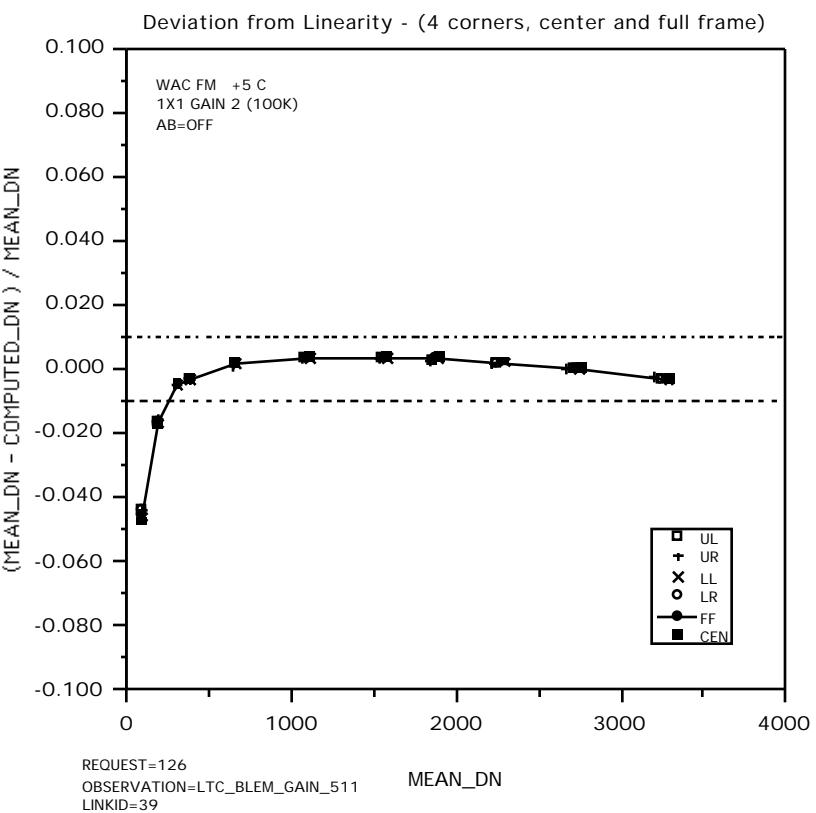
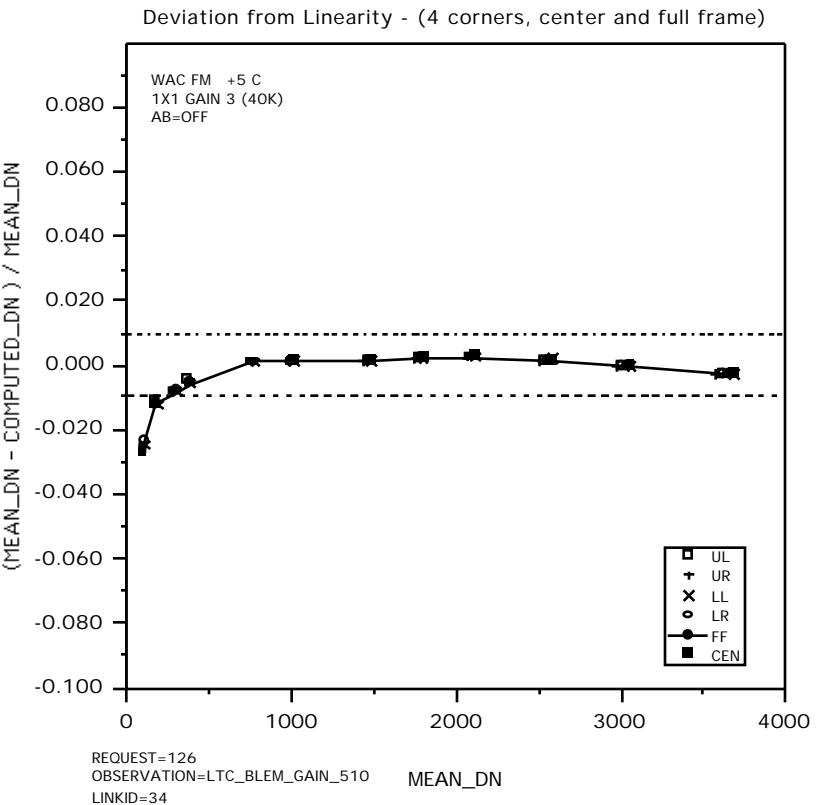
Notes:

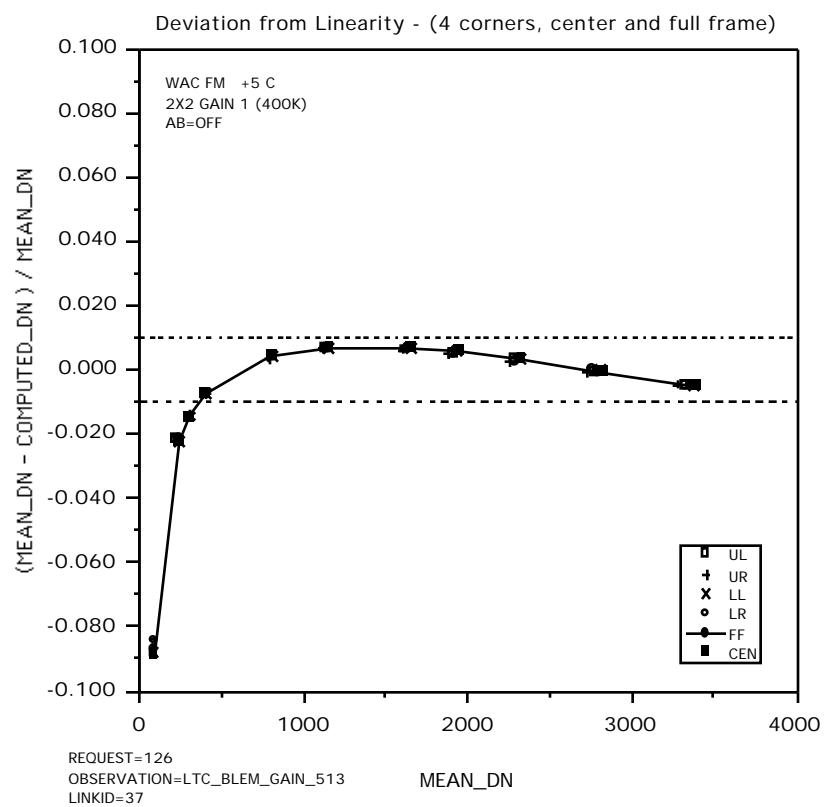
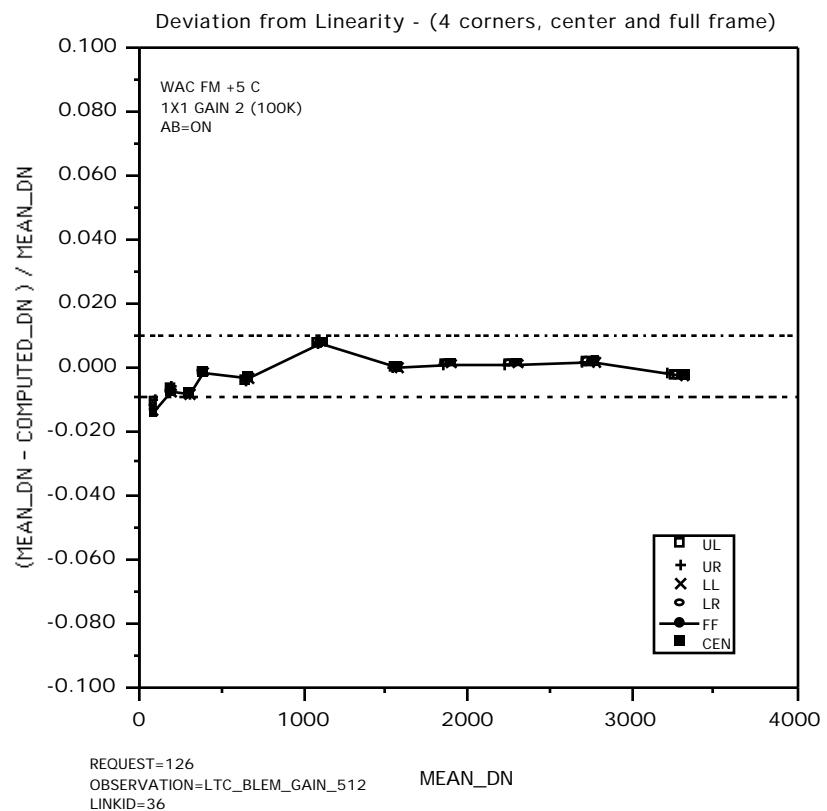
1. Due to linearity problems, the best-fit V and DN_0 for Gain 0 were calculated using exposure times of 0 to 70 milliseconds.

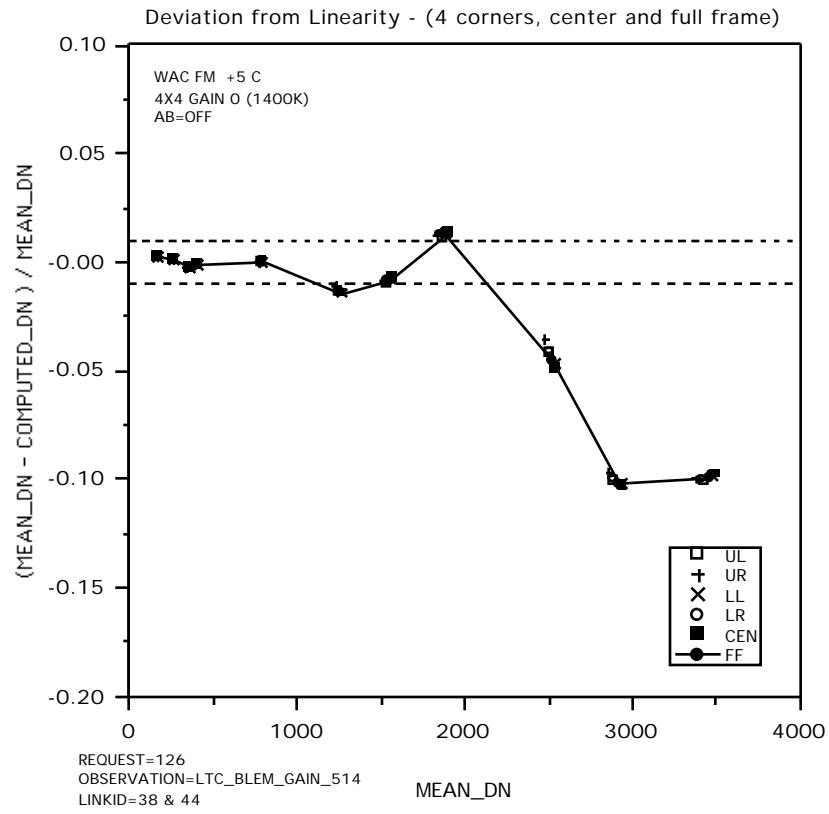












5.1.11.2.4 CONCLUSIONS

1. Except for 4x4 Gain=0, all gains and summation modes remained linear (within ± 1 percent) over the entire dynamic range (excluding deviations at the extreme low end).
2. In 4x4 Gain=0, linearity breaks down at about 1000 DN at both temperatures.
3. Temperatures had no significant effect on the linearity results.
4. Antiblooming had no significant effect on the linearity results.

5.1.11.2.5 IMAGES USED IN LINEARITY ANALYSIS

image	day	time	observation	gain	mode	expos	radiance	image	day	time	observation	gain	mode	expos	radiance
126933	180	4:47:40.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	5	45.20	126956	180	5:20:15.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	220	45.20
126934	180	4:49:19.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	5	45.20	126957	180	5:21:44.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	260	45.20
126935	180	4:50:38.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	5	45.20	126958	180	5:23:13.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	260	45.20
126936	180	4:51:44.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	15	45.20	126959	180	5:24:42.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	260	45.20
126937	180	4:53:13.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	15	45.20	126960	180	5:25:48.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	320	45.20
126938	180	4:54:42.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	15	45.20	126961	180	5:27:17.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	320	45.20
126939	180	4:56:11.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	30	45.20	126962	180	5:28:46.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	320	45.20
126940	180	4:57:40.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	30	45.20	126963	180	5:30:15.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	380	45.20
126941	180	4:59:19.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	30	45.20	126964	180	5:31:44.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	380	45.20
126942	180	5:01:55.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	40	45.20	126965	180	5:33:13.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	380	45.20
126943	180	5:11:44.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	40	45.20	126966	180	5:34:19.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	460	45.20
126944	180	5:13:13.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	40	45.20	126967	180	5:35:48.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	460	45.20
126945	180	5:14:42.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	90	45.20	126968	180	5:37:17.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	460	45.20
126946	180	5:16:11.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	90	45.20	126969	180	5:38:31.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	5	50.20
126947	180	5:17:40.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	90	45.20	126970	180	5:39:00.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	5	50.20
126948	180	5:18:46.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	120	45.20	126975	180	2:11:31.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	5	50.20
126949	180	5:10:15.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	120	45.20	126982	180	1:20:6.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	30	50.20
126950	180	5:11:44.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	120	45.20	126983	180	1:21:35.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	30	50.20
126952	180	5:14:42.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	180	45.20	126984	180	1:23:4.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	30	50.20
126953	180	5:16:11.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	180	45.20	126985	180	1:24:33.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	60	50.20
126959	180	6:11:48.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	180	45.20	126986	180	1:26:2.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	60	50.20
126954	180	5:17:17.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	220	45.20	126987	180	1:27:31.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	60	50.20
126955	180	5:18:46.0	LTC_BLEM_GAIN_500	3 (40K)	FULL	220	45.20	126989	180	1:30:6.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	80	50.20

126850	180	1:31:35.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	80	50.20	129893	194	14:5:51.0	LTC_BLEM_GAIN_510	3 (40K)	FULL	120	42.80
126876	180	2:12:37.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	80	50.20	129894	194	14:7:21.0	LTC_BLEM_GAIN_510	3 (40K)	FULL	180	42.80
126853	180	1:34:32.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	150	50.20	129895	194	14:8:50.0	LTC_BLEM_GAIN_510	3 (40K)	FULL	180	42.80
126877	180	2:14:6.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	150	50.20	129897	194	14:11:24.0	LTC_BLEM_GAIN_510	3 (40K)	FULL	220	42.80
126854	180	1:37:8.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	260	50.20	129898	194	14:12:53.0	LTC_BLEM_GAIN_510	3 (40K)	FULL	220	42.80
126855	180	1:38:37.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	260	50.20	129900	194	14:15:52.0	LTC_BLEM_GAIN_510	3 (40K)	FULL	260	42.80
126856	180	1:40:6.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	260	50.20	129901	194	14:17:21.0	LTC_BLEM_GAIN_510	3 (40K)	FULL	260	42.80
126857	180	1:41:35.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	380	50.20	129902	194	14:18:50.0	LTC_BLEM_GAIN_510	3 (40K)	FULL	260	42.80
126858	180	1:43:4.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	380	50.20	129914	194	14:45:6.0	LTC_BLEM_GAIN_510	3 (40K)	FULL	260	42.80
126859	180	1:44:33.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	380	50.20	129903	194	14:19:55.0	LTC_BLEM_GAIN_510	3 (40K)	FULL	320	42.80
126861	180	1:47:8.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	460	50.20	129904	194	14:21:24.0	LTC_BLEM_GAIN_510	3 (40K)	FULL	320	42.80
126862	180	1:48:37.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	460	50.20	129905	194	14:22:53.0	LTC_BLEM_GAIN_510	3 (40K)	FULL	320	42.80
126878	180	2:15:12.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	460	50.20	129906	194	14:24:23.0	LTC_BLEM_GAIN_510	3 (40K)	FULL	380	42.80
126863	180	1:50:16.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	560	50.20	129907	194	14:25:52.0	LTC_BLEM_GAIN_510	3 (40K)	FULL	380	42.80
126864	180	1:51:35.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	560	50.20	129908	194	14:27:21.0	LTC_BLEM_GAIN_510	3 (40K)	FULL	380	42.80
126865	180	1:53:4.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	560	50.20	129909	194	14:28:32.0	LTC_BLEM_GAIN_510	3 (40K)	FULL	460	42.80
126867	180	1:55:39.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	680	50.20	129910	194	14:30:1.0	LTC_BLEM_GAIN_510	3 (40K)	FULL	460	42.80
126868	180	1:56:39.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	680	50.20	129911	194	14:31:30.0	LTC_BLEM_GAIN_510	3 (40K)	FULL	460	42.80
126869	180	1:58:37.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	820	50.20	130006	195	3:15:58.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	5	50.20
126871	180	2:13:5.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	820	50.20	130017	195	3:15:58.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	5	50.20
126879	180	2:16:18.0	LTC_BLEM_GAIN_501	2 (100K)	FULL	820	50.20	130141	195	4:13:6.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	5	50.20
126973	180	6:59:10.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	5	47.70	130108	195	3:16:44.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	30	50.20
126974	180	7:0:14.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	5	47.70	130109	195	3:18:13.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	30	50.20
126975	180	7:1:18.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	5	47.70	130110	195	3:19:42.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	30	50.20
126976	180	7:1:57.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	35	47.70	130111	195	3:21:11.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	60	50.20
126977	180	7:3:31.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	35	47.70	130112	195	3:22:40.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	60	50.20
126978	180	7:4:5.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	35	47.70	130113	195	3:24:19.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	60	50.20
126979	180	7:5:9.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	50	47.70	130114	195	3:25:15.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	80	50.20
126980	180	7:6:13.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	50	47.70	130116	195	3:28:13.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	80	50.20
126981	180	7:7:17.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	50	47.70	130118	195	3:31:11.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	150	50.20
126982	180	7:8:0.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	70	47.70	130119	195	3:32:40.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	150	50.20
126983	180	7:9:4.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	70	47.70	130143	195	4:15:41.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	150	50.20
126984	180	7:10:8.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	70	47.70	130120	195	3:33:46.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	260	50.20
126985	180	7:11:12.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	150	47.70	130121	195	3:35:15.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	260	50.20
126986	180	7:12:16.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	150	47.70	130122	195	3:36:43.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	260	50.20
126987	180	7:13:20.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	150	47.70	130123	195	3:38:12.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	380	50.20
126988	180	7:13:59.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	220	47.70	130125	195	3:41:11.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	380	50.20
126990	180	7:16:16.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	220	47.70	130126	195	3:42:17.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	460	50.20
126991	180	7:17:11.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	320	47.70	130127	195	3:43:46.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	460	50.20
126992	180	7:18:15.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	320	47.70	130128	195	3:45:15.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	460	50.20
126993	180	7:19:19.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	320	47.70	130129	195	3:46:44.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	560	50.20
126994	180	7:20:2.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	380	47.70	130130	195	3:48:13.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	560	50.20
126995	180	7:21:6.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	380	47.70	130131	195	3:49:42.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	560	50.20
126996	180	7:22:10.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	380	47.70	130132	195	3:50:48.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	680	50.20
126997	180	7:23:14.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	460	47.70	130133	195	3:52:17.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	680	50.20
126998	180	7:24:18.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	460	47.70	130144	195	4:16:47.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	680	50.20
126999	180	7:25:22.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	460	47.70	130135	195	3:55:15.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	820	50.20
127000	180	7:26:5.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	560	47.70	130137	195	3:58:13.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	820	50.20
127002	180	7:28:13.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	560	47.70	130145	195	4:18:16.0	LTC_BLEM_GAIN_511	2 (100K)	FULL	820	50.20
127003	180	7:29:17.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	680	47.70	130150	195	8:53:26.0	LTC_BLEM_GAIN_512	2 (100K)	FULL	5	50.20
127004	180	7:30:21.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	680	47.70	130151	195	8:54:55.0	LTC_BLEM_GAIN_512	2 (100K)	FULL	5	50.20
127005	180	7:31:25.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	680	47.70	130152	195	8:56:24.0	LTC_BLEM_GAIN_512	2 (100K)	FULL	5	50.20
127006	180	7:32:36.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	680	47.70	130153	195	8:57:29.0	LTC_BLEM_GAIN_512	2 (100K)	FULL	30	50.20
127007	180	7:33:10.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	680	47.70	130154	195	8:58:36.0	LTC_BLEM_GAIN_512	2 (100K)	FULL	30	50.20
127008	180	7:34:14.0	LTC_BLEM_GAIN_502	1 (400K)	SUM2	820	47.70	130155	195	9:53:58.0	LTC_BLEM_GAIN_512	2 (100K)	FULL	30	50.20
127010	180	7:35:39.0	LTC_BLEM_GAIN_502	1 (400K)	SUM4	5	58.80	130156	195	9:51:56.0	LTC_BLEM_GAIN_512	2 (100K)	FULL	60	50.20
127012	180	7:36:42.0	LTC_BLEM_GAIN_502	1 (400K)	SUM4	5	58.80	130157	195	9:52:36.0	LTC_BLEM_GAIN_512	2 (100K)	FULL	60	50.20
127122	183	6:34:23.0	LTC_BLEM_GAIN_503	0 (140K)	SUM4	15	58.80	130158	195	9:45:55.0	LTC_BLEM_GAIN_512	2 (100K)	FULL	60	50.20
127124	183	6:36:15.0	LTC_BLEM_GAIN_503	0 (140K)	SUM4	15	58.80	130159	195	9:6:0.0	LTC_BLEM_GAIN_512	2 (100K)	FULL	80	50.20
127126	183	6:37:47.0	LTC_BLEM_GAIN_503	0 (140K)	SUM4	25	58.80	130187	195	9:54:23.0	LTC_BLEM_GAIN_512	2 (100K)	FULL	80	50.20
127127	183	6:38:38.0	LTC_BLEM_GAIN_503	0 (140K)	SUM4	25	58.80	130162	195	9:10:28.0	LTC_BLEM_GAIN_512	2 (100K)	FULL	150	50.20
127128	183	6:39:8.0	LTC_BLEM_GAIN_503	0 (140K)	SUM4	30	58.80	130163	195	9:11:57.0	LTC_BLEM_GAIN_512	2 (100K)	FULL	150	50.20
127130	183	6:40:50.0	LTC_BLEM_GAIN_503	0 (140K)	SUM4	30	58.80	130164	195	9:13:26.0	LTC_BLEM_GAIN_512	2 (100K)	FULL	150	50.20
127132	183	6:42:32.0	LTC_BLEM_GAIN_503	0 (140K)	SUM4	70	58.80	130166	195	9:16:0.0	LTC_BLEM_GAIN_512	2 (100K)	FULL	260	50.20
127133	183	6:43:23.0	LTC_BLEM_GAIN_503	0 (140K)	SUM4	70	58.80	130188	195	9:55:29.0	LTC_BLEM_GAIN_512	2 (100K)	FULL	260	50.20
127148	183	6:56:1.0	LTC_BLEM_GAIN_503	0 (140K)	SUM4	320	58.80	130177	195	9:31:33.0	LTC_BLEM_GAIN_512	2 (100K)	FULL	680	50.20
126886	180	2:51:49.0	LTC_BLEM_GAIN_504	2 (100K)											

130245	195	12:38:12.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	70	58.80
130246	195	12:39:3.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	70	58.80
130247	195	12:39:54.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	70	58.80
130248	195	12:40:23.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	120	58.80
130249	195	12:41:14.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	120	58.80
130250	195	12:42:5.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	120	58.80
130251	195	12:42:57.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	150	58.80
130252	195	12:43:48.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	150	58.80
130253	195	12:44:39.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	150	58.80
130254	195	12:45:6.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	180	58.80
130255	195	12:45:57.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	180	58.80
130256	195	12:46:48.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	180	58.80
130257	195	12:47:40.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	260	58.80
130258	195	12:48:31.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	260	58.80
130259	195	12:49:22.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	260	58.80
130260	195	12:49:49.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	320	58.80
130261	195	12:50:40.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	320	58.80
130262	195	12:51:31.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	320	58.80
130263	195	12:52:23.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	380	58.80
130264	195	12:53:14.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	380	58.80
130265	195	12:54:5.0	LTC_BLEM_GAIN_514	0	(1400K)	SUM4	380	58.80